

Claims

1. A combined information display and information input device comprising a matrix of independently addressable light emitting devices and a plurality of light sensing devices, said light emitting devices comprising organic light emitting diodes comprising organic light emitting material positioned between a low work function electrode and a high work function electrode characterised in that said light sensing devices comprise organic photovoltaic devices comprising at least an organic electron donor and at least an organic electron acceptor positioned between a high work function electrode and a low work function electrode.
2. A combined information display and information input device according to claim 1 wherein at least one of said organic electron donor and said organic electron acceptor comprises a semiconductive organic polymer.
3. A combined information display and information input device according to claim 1 wherein at least one of said organic electron donor and said organic electron acceptor comprises a fullerene.
4. A combined information display and information input device according to claim 1 wherein said organic electron donor and said organic electron acceptor comprise semiconductive organic polymers.
5. A combined information display and information input device according to claim 1 wherein said organic electron donor and said organic electron acceptor comprise a blend of semiconductive organic electron donor polymer and semiconductive organic electron acceptor polymer.
6. A combined information display and information input device according to claims 2, 4 or 5 wherein said semiconductive organic polymers are selected from the group comprising polyfluorene, polybenzothiazole, polytriarylamine, poly(phenylenevinylene) and polythiophene.
7. A combined information display and information input device according to claim 1 wherein said high work function electrode of said organic photovoltaic device comprises a material having a work function of greater than 4.3 eV.

8. A combined information display and information input device according to claim 7 wherein said high work function electrode of said organic photovoltaic device comprises indium tin oxide.
9. A combined information display and information input device according to claim 1 wherein said organic photovoltaic device further comprises a layer of hole transporting material positioned between said organic electron donor and organic electron acceptor and said high work function electrode.
10. A combined information display and information input device according to claim 9 wherein said layer of hole transporting material comprises polystyrene sulfonic acid doped polyethylene dioxythiophene.
11. A combined information display and information input device according to claim 1 wherein said low work function electrode of said organic photovoltaic device comprises a material having a work function of less than 3.5 eV.
12. A combined information display and information input device according to claim 11 wherein said low work function electrode of said organic photovoltaic device comprises a material selected from the group comprising Mg, Ca, Ba and Al.
13. A combined information display and information input device according to claim 1 wherein said organic photovoltaic device further comprises a layer of insulating material positioned between said organic electron donor and organic electron acceptor and said low work function electrode, said insulating material being sufficiently thin to allow the collection of charge carriers into the low work function electrode from said organic electron donor and organic electron acceptor.
14. A combined information display and information input device according to claim 13 wherein said insulating material has a thickness of between 1 nm and 10 nm.
15. A combined information display and information input device according to claim 13 wherein said insulating material is selected from the group comprising alkali or alkaline earth metal fluorides.

16. A combined information display and information input device according to claim 1 wherein said high work function electrode of said organic light emitting device comprises a material having a work function of greater than 4.3 eV.
17. A combined information display and information input device according to claim 16 wherein high work function electrode of said organic light emitting device comprises indium tin oxide.
18. A combined information display and information input device according to claim 1 wherein said organic light emitting diode further comprises a layer of hole transporting material positioned between said organic light emitting material and said high work function electrode.
19. A combined information display and information input device according to claim 18 wherein said layer of hole transporting material comprises polystyrene sulfonic acid doped polyethylene dioxythiophene.
20. A combined information display and information input device according to claim 1 wherein said low work function electrode of said organic light emitting device comprises a material having a work function of less than 3.5 eV.
21. A combined information display and information input device according to claim 20 wherein said low work function electrode of said organic light emitting device comprises a material selected from the group comprising Mg, Ca, Ba and Al.
22. A combined information display and information input device according to claim 1 wherein said organic light emitting device further comprises a layer of insulating material positioned between said organic light emitting material and said low work function electrode, said insulating material being sufficiently thin to allow the injection of charge carriers from the low work function electrode into the organic light emitting layer.
23. A combined information display and information input device according to claim 22 wherein said insulating material has a thickness of between 1 nm and 10 nm.

24. A combined information display and information input device according to claim 22 wherein said insulating material is selected from the group comprising alkali or alkaline earth metal fluorides.
25. A combined information display and information input device according to claim 1 wherein said organic light emitting material comprises a semiconductive organic polymer.
26. A combined information display and information input device according to claim 25 wherein said semiconductive organic polymer is selected from the group comprising polyfluorene, polybenzothiazole, polytriarylamine, poly(phenylenevinylene) and polythiophene.
27. A combined information display and information input device according to claim 1 wherein some or all of said organic photovoltaic devices are sensitive to light in a non-visible region of the electromagnetic spectrum.
28. A combined information display and information input device according to claim 27 wherein some or all of said organic photovoltaic devices are sensitive to light in the infrared region of the electromagnetic spectrum.
29. A combined information display and information input device according to claim 1 wherein said organic light emitting devices comprise a first group of organic light emitting devices and a second group of organic light emitting devices, said first group of said organic light emitting devices emitting light of a first colour and said second group of said organic light emitting devices emitting light of a second colour.
30. A combined information display and information input device according to claim 29 wherein said organic light emitting devices comprise a third group of light emitting devices said third group of light emitting devices emitting light of a third colour.
31. A combined information display and information input device according to claim 30 wherein said first, second and third colours are selected from amongst red, green and blue.

32. A combined information display and information input device according to claim 1 wherein said organic light emitting devices comprise a group of light emitting devices emitting light of a colour in the visible range of the electromagnetic spectrum and a further group of light emitting devices emitting light in a non visible region of the electromagnetic spectrum.
33. A combined information display and information input device according to claim 32 wherein said further group of light emitting devices emit light in the infrared region of the electromagnetic spectrum
34. A combined information display and information input device according to claim 1 wherein said matrix of independently addressable light emitting devices comprises a plurality of light emitting device addressing column electrodes and a plurality of light emitting device addressing row electrodes, said organic light emitting devices being positioned at the intersection of said column electrodes and said row electrodes.
35. A combined information display and information input device according to claim 34 wherein said plurality of light sensing devices comprises a matrix of independently addressable light sensing devices.
36. A combined information display and information input device according to claim 35 wherein said matrix of independently addressable light sensing devices comprises a plurality of light sensing device addressing column electrodes and a plurality of light sensing device addressing row electrodes, said light sensing devices being positioned at the intersection of said column electrodes and said row electrodes.
37. A combined information display and information input device according to claim 36 further comprising a combined column driver and detector for addressing said light emitting device column electrodes and said light sensing device column electrodes, said column driver and detector comprising circuitry for providing a forward bias to said light emitting devices to cause them to emit light and comprising circuitry for detecting light incident on said light sensing devices.
38. A combined information display and information input device according to claim 36 comprising a) a column driver for addressing said light emitting device column

electrodes said column driver comprising circuitry for providing a forward bias to said light emitting devices to cause them to emit light and comprising b) a column detector for addressing said light sensing device column electrodes, said column detector comprising circuitry for detecting light incident on said light sensing devices.

39. A combined information display and information input device according to any of claims 36 to 38 further comprising a combined row selector driver for addressing said light emitting device row electrodes and said light sensing device row electrodes.
40. A combined information display and information input device according to any of claims 36 to 38 further comprising a) a light emitting device row selector driver for addressing said light emitting devices row electrodes and b) a light sensing device row selector driver for addressing said light sensing device row electrodes.
41. A combined information display and information input device according to claims 37 or 38 wherein said combined column driver and detector or said column detector further comprises a means for reverse biasing said light sensing devices.
42. A combined information display and information input device according to claim 39 or 40 further comprising a clock signal generating means for providing a scanning signal to the combined row selector driver or to said light emitting device row selector driver and said light sensing device row selector driver.
43. A combined information display and information input device according to claim 42 wherein said clock signal generating means provides scanning signals to the combined row selector driver or to said light emitting device row selector driver and said light sensing device row selector driver at a first higher frequency and a second lower frequency said first higher frequency scanning signal addressing said light emitting device row electrodes and said second lower frequency scanning signal addressing said light sensing device row electrodes.
44. A combined information display and information input device according to claim 40 further comprising a first clock signal generating means and a second clock

signal generating means said first clock signal generating means providing a scanning signal to said light emitting device row electrodes and said second clock signal generating means providing a scanning signal to said light sensing device row electrodes.

45. A combined information display and information input device according to claim 44 wherein said first clock signal generating means provides a higher frequency scanning signal than said second clock signal generating means.
46. Method of preparing a combined information display and information input device comprising;
- a) providing a substrate,
 - b) providing a patterned layer of conducting material having a high work function,
 - c) providing a patterned layer of organic light emitting material and a patterned layer of organic photovoltaic material said organic photovoltaic material comprising at least an organic electron donor and at least an organic electron acceptor,
 - d) providing a layer of a conducting material having a low work function.
47. Method of preparing a combined information display and information input device according to claim 46 wherein said layer of conducting material of low work function is provided as a patterned layer of conductive material of low work function.
48. Method of preparing a combined information display and information input device according to claim 46 further comprising of providing a patterned layer of hole transporting material over said layer of conductive material of high work function.
49. Method of preparing a combined information display and information input device according to claim 46 wherein at least one of said steps of providing a patterned layer of organic light emitting material, a patterned layer of organic photovoltaic material or patterned layer of hole transporting material over said layer of conductive material of high work function comprises applying said material using a method of selective printing.
50. Method of preparing a combined information display and information input device according to claim 49 wherein said method of selective printing comprises ink-jet printing, flexographic printing, gravure printing or screen printing.

51. Method of preparing a combined information display and information input device according to claim 50 wherein said method of selective printing comprises ink-jet printing.

52. Method of preparing a combined information display and information input device according to claim 1 comprising;

- a) providing a substrate,
- b) providing a patterned layer of conducting material having a high work function,
- c) providing a first layer of insulating material over said layer of conducting material said first layer of insulating material being patterned to form a series of wells,
- d) providing a second layer of insulating material said second layer of insulating material being patterned to form a series of parallel banks over said first layer of insulating material,
- e) optionally depositing by means of ink-jet printing a layer of hole transporting material into a selection of said wells,
- f) depositing by means of ink-jet printing a layer of an organic light emitting material into a first selection of said wells,
- g) depositing by means of ink-jet printing a layer of organic photovoltaic material comprising at least an organic electron donor and at least an organic electron acceptor into a second selection of said wells,
- h) depositing a layer of a conducting material having a low work function over said layer of organic light emitting material and said layer of organic photovoltaic material, wherein steps f) and g) may be carried out in any order.

53. Method of preparing a combined information display and information input device according to claim 1 comprising;

- a) providing a substrate,
- b) providing a patterned layer of conducting material having a high work function,
- c) providing a first layer of insulating material over said layer of conducting material said first layer of insulating material being patterned to form a series of wells,
- d) providing a second layer of insulating material, said second layer of insulating material being patterned to form a series of parallel banks over said first layer of insulating material,
- e) optionally depositing by means of ink-jet printing a layer of hole transporting material into a selection of said wells,

- f) depositing by means of ink-jet printing a third layer of insulating material in a first selection of said wells,
- g) depositing by means of ink-jet printing a layer of an organic light emitting material into a second selection of said wells,
- h) depositing by means of ink-jet printing a layer of organic photovoltaic material comprising at least an organic electron donor and at least an organic electron acceptor into a third selection of said wells,
- i) depositing a layer of a conducting material having a low work function over said layer of organic light emitting material and said layer of organic photovoltaic material, wherein steps e), f), g) or h) may be carried out in any order provided that when present the layer of hole transporting material is deposited prior to the deposition of the organic light emitting material or the organic photovoltaic material.

54. Use of a combined information display and information input device according to claim 1 as a touch screen.

55. Use of a combined information display and information input device according to claim 1 as an image scanner.

56. Mobile communication device comprising a combined information display and information input device according to claim 1.